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Engineering Design File

Evaporation Pond Berm Overtopping Analysis (60% Design Component)

Idaho National Engineering and Environmental Laboratory

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ENGINEERING DESIGN FILE

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ABSTRACT

This engineering design file contains the INEEL CERCLA Disposal Facility engineering calculation for Berm Overtopping Analysis from Wind Setup and Wave Runup.

This analysis discusses the procedures and findings for the analysis of wind setup, wave generation, and wave runup in the East and West Evaporation Ponds of the INEEL CERCLA Disposal Facility at the Idaho National Engineering and Environmental Laboratory in southern Idaho.

CONTENTS

ACRONYMS

ACES	Automated Coastal Engineering System
CEDAS	Coastal Engineering Design and Analysis
CERCLA	Comprehensive Environmental Response, Compensation, and Liabilities Act
CFA	Central Facilities Area
cm/sec	centimeters per second
COE	U.S. Army Corps of Engineers
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy - Idaho
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho Engineering and Environmental Laboratory
NRC	Nuclear Regulatory Commission

Evaporation Pond Berm Overtopping Analysis

1. BERM OVERTOPPING ANALYSIS FROM WIND SETUP AND WAVE RUNUP

This section discusses the procedures and findings for the analysis of wind setup, wave generation, and wave runup in the East and West Evaporation Ponds of the INEEL CERCLA Disposal Facility (ICDF) in southern Idaho. As both ponds are of equal dimension and water depth, analysis was only performed for the West Evaporation Pond.

1.1 Analysis of Wind and Wind Setup, Waves, and Wave Runup

Analysis for setup (e.g., change in water surface elevation due to wind stress), wave height and period, and wave runup height was performed to determine the total wave runup elevation reached by the waves surging up the berm slope.

1.1.1 Wind

A 70-mph design wind speed was provided by others. The tables in Appendix A, taken from the *INEEL Climatology Report* (DOE-ID 1989), show the average monthly and annual wind speeds and peak wind gusts. These data were examined to determine whether the 70-mph value was representative of high wind speeds at the site. Wind observations recorded at the site from April 1950 through October 1983 are reported. Annual maximum sustained wind speeds for each year of observation were not available from the information provided, so return-period wind speeds could not be calculated.

The two highest hourly average speeds from 1950 to 1983 were southwest (SW) 52 mph and west-southwest (WSW) 67 mph. The ponds are oriented such that the longest fetch is north-south. Thus, the 67-mph WSW wind would be blowing over a much shorter fetch than would the 52-mph SW wind. It is reasonable to assume that an S 70-mph wind could occur and blow along the maximum fetch. Fetches are short (316 ft for 4-ft design water depth), and waves would reach their maximum development in less than 30 minutes, based on wave development calculations.

More recent wind data is available for the Idaho National Engineering and Environmental Laboratory (INEEL) through the National Oceanic and Atmospheric Administration (NOAA) on the website at http://www.NOAA.gov/. A review of the most recent information (through August 2001) indicates that the latest data is consistent with the data in the *INEEL Climatology Report* and does not show outliers from previously reviewed data. This review confirms that the design wind speeds evaluated in this engineering design file extend well beyond the range of anticipated sustained wind speeds at the site.

1.1.2 Waves

The Coastal Engineering Design and Analysis (CEDAS) software package from Veri-Tech, Inc. was used for the analysis of shallow water waves. CEDAS uses the U.S. Army Corps of Engineers (COE) Automated Coastal Engineering System (ACES) program "Windspeed Adjustment and Wave Growth."

Wave analysis used shallow-water computational methods for estimating the spectral energy-based non-breaking significant wave height, H_{mo} and peak spectral period T_p. For all practical purposes, $H_{mo}=H_s$, which is the more familiar significant wave height, given the average height of the highest 33% of the waves in a wave train. Hereinafter, H_s will be used for significant wave height.

Development of waves depends on wind speed and duration, length of fetch, stability of the air relative to the water, and depth of water. The shallow-water wave equations assume a constant water depth and take into account the effects of bottom friction and percolation that reduce wave generation. Notably, the effect of pond depth on wave height generation is relatively small, as illustrated in sensitivity analyses discussed later in this engineering design file. For the shallow-water method, there is no provision for wind duration, so H_s is the largest significant wave height that can be generated by the given wind speed. The program adjusts wind speed for the height of measurement above the water's surface, as well as the location of the measurements relative to the body of water. A sample printout from ACES is included as Appendix B. Leenknecht, et al. (1992) provides a detailed discussion of the algorithms used by ACES.

The shallow water and the high wind speeds involved made it necessary to reduce most of the wave heights from CEDAS results because of the limits imposed for wave steepness (ratio of wave height to wavelength). Linear wave theory, in which the maximum value of wave height to wavelength is 1/7 = 0.143, was used. For waves having a higher ratio than this, the waves would break before reaching the predicted wave height.

1.1.3 Wave Runup on the North Berm

Wave runup on the berm face was estimated with the use of CEDAS "Wave Runup and Overtopping on Impermeable Structures." H_s and T_p from the results of the wave analysis above were used as input, and a sample printout is included as Appendix C.

Wave runup was determined for a smooth berm face with a slope of 1V:3H. The height of wave runup is measured vertically from the elevation of the water surface at the face of the berm. Runup height was added to the stillwater elevation plus wind setup height to determine the elevation of the wave runup.

1.1.4 Wind Setup

Wind blowing across a body of water confined by a fixed boundary will change the elevation of the water surface, provided the wind is strong enough. In the case of the West (and East) Evaporation Ponds, a simplified approach was taken that was based on procedures in Wiegel (1964) and Ippen (1966), which lend themselves to relatively uncomplicated basin geometries.

The shear stress on the water surface is related to the wind speed. The water piles up at the downwind side of the basin and the water elevation decreases at the upwind end of the basin. The basins meet the classification of an "Enclosed Lake" for the computation of wind setup. For simplification, it was assumed that the basins have a flat bottom and an average constant stillwater depth throughout the basin for a given water level. The tables in Wiegel (1964) were entered using Equation (1):

$$\kappa U_o^2 F/(gd^2) \text{ and } x/F \qquad (1)$$

Where:

Dimensionless coefficient = κ = 3.3×10^{-3}

U_o = wind speed (ft/sec)

F = fetch length (ft)

g = 32.2 ft/sec^2

d = water depth (ft)

x = distance from start of fetch to point of interest (ft).

For the basins, the point of interest was x/F = 1.0, which is the downwind limit of the fetch. The tables in Wiegel (1964) provided estimates of wind setup distance above stillwater in terms of h/d, where h is the distance from stillwater to the raised water surface. At x/F = 0 at the start of the fetch, there is a setdown in the water surface, and h/d at that point is negative. A spreadsheet was developed to calculate the two parameters for entering the tables, and tabular values were entered on the spreadsheet (presented in Appendix D). For parameters of $\kappa U_o^2F/(gd^2)$ <0.201, a regression curve for values of h/d based on the tables was determined and used for calculation of h/d outside of the range of the tables. Wind setup was calculated for the cases shown in Appendix D. Sensitivity computations were made for various wind speeds from 70 mph to 200 mph for water depths of 2, 3, 4, and 5 ft.

1.2 Results of Computations

As presented in Appendix E, runup elevations were determined for 70- to 200-mph winds and waves for water depth = 4 ft and 70 to 100 mph for water depth = 5 ft. A water depth of 4 ft is based on the highest water level determined from evaporation pond sizing calculations (DOE-ID 2001) and results in a stillwater depth elevation of 4928.0. The water depth of 5 ft is representative of the 2-ft freeboard depth below the pond crest elevation and results in a stillwater depth elevation of 4929.0. It was not necessary to calculate runup elevations for the 2- and 3-ft water depths, as the runup elevations would be well below the berm crest.

1.3 Conclusions

The runup elevation for the 70-mph design wind and maximum design water depth of 4 ft is 4928.7 ft, which corresponds to a runup of 8 in. above pond stillwater elevation. This is 2.3 ft below the crest of the berm (elevation 4931 ft). It is estimated that a sustained wind in excess of 200 mph would be required to create runup elevations reaching the berm crest elevation of 4931.0. At 200 mph, the runup elevation is estimated at 4930.0, or 1 ft below the berm crest elevation. The most reasonable conclusion is that the wave runup will not overtop the crest of the berm under any conceivable wind speed at the project site. Therefore, the 2 ft of freeboard required by the regulations is adequate to prevent overtopping.

2. REFERENCES

DOE-ID, 2001, "Evaporation Pond Sizing with Water Balance and Make-up Water Calculations," Rev. 0, EDF-ER-271, Department of Energy Idaho Operation Office, Idaho Falls, Idaho.

DOE-ID, 1989, *Climatology of the INEL*, DOE/ID-12118, Department of Energy Idaho Operation Office, Idaho Falls, Idaho.

Ippen, Arthur T., 1966, *Estuary and Coastline Hydrodynamic,* McGraw-Hill Book Co., Inc., New York, New York.

Leenknecht, David A., A. Szuwalski, and A. R. Sherlock, 1992, *Automated Coastal Engineering System User's Guide (Version 1.07),* Department of the Army, Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi.

Wiegel, Robert L, 1964, *Oceanographical Engineering,* Prentice-Hall, Englewood Cliffs, New Jersey.

Appendix A

Average Monthly and Annual Wind Speeds For CFA

SOURCE: INEEL CLIMATOLOGY REPORT.

Table A-1. Average monthly and annual wind speeds for CFA at 20 and 250 ft. AGL together with the highest hourly average wind speed and the concurrent direction of occurrence.

	Monthly Average		Highest Hourly Average			
	20-ft.[a] Level (mph)	250-ft.[b] Level (mph)	20-ft. Level[c] Speed (mph)	20-ft. Level[c] Direction (quad.)	250-ft. Level[d] Speed (mph)	250-ft. Level[d] Direction (quad.)
January	5.6	9.7	48	WSW	65	SW
February	6.9	11.3	36	SW	52	WSW
March	8.7	13.8	51	WSW	67	WSW
April	9.3	14.6	39	WSW	49	WSW-SW
May	9.3	14.3	41	SW	47	WSW-SW
June	8.9	14.2	36	SW	46	WSW-SW
July	8.0	13.5	35	WSW	47	WSW
August	7.7	13.1	40	WSW	54	SW
September	7.2	12.8	42	WSW	56	WSW
October	6.8	12.3	44	WSW	58	WSW
November	6.4	11.6	40	WSW	54	WSW
December	5.1	9.6	43	SW	56	SW
ANNUAL	7.5	12.6	51	WSW	67	WSW

a. Data period of record spans April 1950 through October 1964.
b. Data period of record spans July 1951 through October 1964.
c. Data period of record spans April 1950 through October 1983.
d. Data period of record spans July 1951 through October 1983.

Peak wind gusts stratified by month and observed at CFA and TAN are given in Table A-3. The measurement levels are the same as those given previously. The maximum instantaneous gust recorded at CFA at the 20 Ft. level was 78 mph from the west-southwest. The maximum gust at the same level at TAN was 67 mph from the south. Higher gusts occur at greater heights on each of the towers. Winds gusts at the INEL may be a result of either pressure gradients from large-scale systems, or the result of local thunderstorms. Most gusts from pressure gradients are channeled from the southwest. However, gusts from thunderstorms can be expected from any direction since they may form in any location and move in any direction.

Regional Near-surface Wind Flow Patterns

Hourly-averaged historical wind data have been used to assemble an INEL and vicinity map containing wind roses from each of the meteorological monitoring stations (Figure III-1). This map is illustrated in Figure A-13a with the wind rose from each off-site station and representative on-site stations presented its relative geographical position. A wind rose map of the INEL containing only data from on-site stations, with the exception of TRA, is presented in Figure A-13b. The GRD3 wind rose is representative of TRA. Data from a two or three-year period (usually January 1980 through December 1982)

T ble A-3. Monthly and period of record peak wind gusts with concurrent wind directions for CFA at 20 and 250 ft. AGL and for TAN at 20 and 150 ft. AGL

USE FOR INEEL CDF

	CFA				TAN			
	20-ft. Level[a]		250-ft. Level[b]		20-ft. Level[c]		150-ft. Level[d]	
	Direction (quad.)	Speed (mph)	Direction (quad.)	Speed (mph)	Direction (quad.)	Speed (mph)	Direction (quad.)	Speed (mph)
January	SW	78	S	75	S	58	NNW	64
February	WSW	60	SW	66	N and SSW	62	SW	59
March	WSW	78	SW	84	N	65	SW	73
April	S	67	SW	62	SSW	60	NW	76
May	SW	62	SSW	67	NNW	60	NNW	66
June	SSW	60	SSW	75	S	67	SW	76
July	N	68	S	66	W	60	W	73
August	WSW	62	SW	72	SSW	64	WSW	68
September	WSW	61	WSW	70	SSW	54	W	73
October	WSW	66	WSW	76	NNW	63	NW	64
November	WSW-SW	60	WSW	70	SW	59	NNW	78
December	SW	64	SSW	80	NNW	62	NNW	68
Period Of Record	WSW	78	SW	84	S	67	NNW	78

a. Data period of record spans April 1950 through October 1964.
b. Data period of record spans July 1951 through October 1964.
c. Data period of record spans July 1950 through April 1961.
d. Data period of record spans April 1956 through April 1961.

Third, channeled canyon cold air drainage dominates the wind distributions at stations located at the boundaries of mountain valleys and the ESRP. Arco (ARC), Blue Dome (BDM), Monteview (MTV) and TAN (particularly the lower level) are dominated by this flow pattern. The Dunes (DUN), the Naval Reactor Facility (NRF), and Rover (ROV) stations have augmented northwesterly winds which result from the influence of these canyon winds as they flow out onto the ESRP. The other monitoring stations not specifically enumerated above exhibit some or all of the main flow characteristics given in the preceding discussion.

An analysis of wind speed and direction distributions at a given station under specific meteorological conditions enhances understanding of the wind flow regime. Wind roses for the 33 and 200 ft. levels on the Grid 3 (GRD3) tower have been prepared for a two-year period (January 1981 through December 1982). The data were categorized into Pasquill-Gifford stability classes, using measured temperature gradients as defined by the U.S. Nuclear Regulatory Commission (U.S. NRC, 1972). These wind roses are illustrated in Figures A-19 and A-20.

Several conclusions can be drawn from the data stratified in this manner. First, in neutral

Appendix B

ACES Sample Printout

Project: INEEL POND, IDAHO
Group: INNELwaves

Case: N18070d4

Windspeed Adjustment and Wave Growth

Item	Value	Units
El of Observed Wind (Zobs)	33.00	feet
Observed Wind Speed (Uobs)	70.00	mph
Air Sea Temp. Diff. (dT)	0.00	deg C
Dur of Observed Wind (DurO)	1.00	hours
Dur of Final Wind (DurF)	1.00	hours
Lat. of Observation (LAT)	0.00	deg
Results		
Wind Fetch Length (F)	315.00	feet
Avg Fetch Depth (d)	4.00	feet
Eq Neutral Wind Speed (Ue)	62.99	mph
Adjusted Wind Speed (Ua)	102.27	mph
Wave Height (Hmo)	0.72	feet
Wave Period (Tp)	1.00	sec
Wave Growth:	Shallow	

Wind Obs Type	Wind Fetch Options
Overwater	Shallow openwater

$H_{max} = 0.72'$ ("RUNUP" MODEL)

$L\ (d = 4.0') = 5.12'$ (FROM "LINEAR WAVE THEORY/SNELL'S LAW" - CEDAS)

$H_{max} = 0.142 \times 5.12 = 0.73'$

CEDAS "RUNUP AND OVERTOPPING ON IMPERMEABLE STRUCTURES" - MAX $\frac{H}{L} = 0.142$.

$H_{max} = 0.72'$ (USE H_{max} FROM "RUNUP" MODEL)

$R_{SMOOTH}\ (1V:3H) = 0.64$ FT

$d_{TOE} = 4.06$ FT

Appendix C

CEDAS Sample Printout

Project: INEEL POND, IDAHO
Group: INEELrunup

Case: N18070d4Rsmooth

Wave Runup and Overtopping on Impermeable Structures

Wave type: Monochromatic   Slope type: Smooth

Rate estimate: Runup

Incident wave height:	0.720	feet	Wave runup:	0.641	ft
Wave period:	1.000	sec			
COTAN of nearshore slope:	1000.000		Deepwater wave height:	0.720	ft
Water depth at structure toe:	4.014	ft	Relative height:	5.575	
COTAN of structure slope:	3.000		Wave steepness:	0.022	
Structure height above toe:	20.000	ft			

Appendix D

Wind Setup Calculations

APPENDIX D

INEEL CERCLA DISPOSAL FACILITY, IDAHO

WIND SETUP FOR EVAPORATION POND

Prepared by: Ken Lilly/CH2M HILL (23 JULY 2001)

Use method in Weigel, Robert L., *Oceanographical Engineering*, Prentice Hall, Englewood Cliffs, NJ, 1964.

From Tables 12.3 and 12.4 (p. 307-308):Let A = (kU^2F)/(gd^2)
k = Wind Stress Coefficient = 0.0000033
U = Wind speed, ft/sec
F = Total fetch length, ft.
g = 32.2 ft/sec^2
d = Stillwater depth, ft.

NOTE 1: When A = 1.125, the water surface is at ground elevation at the upwind limit of the fetch (X/F = 0)
based on Table 12.4 above
kU^2F/gd^2 >/= 0.201 {ALL X/F, use Table 12.3 or 12.4 from Welgel (1964)}

NOTE 2: Use the following relationships when X/F = 0 or 1.0 and A<0.201:
X is the horizontal distance from the upwind limit of the fetch, F.
kU^2F/gd^2 <0.201 {X/F = 0: h/d = -0.5491*kU^2F/gd^2 + 0.0061} and {X/F = 1.0: h/d = 0.4642*kU^2F/gd^2 + 0.0042}

NOTE 3:
N (DESIGN) is the design case for a South/70-mph wind and water depth of 4.0 ft, based on information from Mike Reimbold/SEA 20 JULY 2001.
The remaining cases are for various depths and wind speeds to demonstrate sensitivity of the methodology.

								FROM TABLE 12.3 or 12.4 (SETDOWN EXPOSES BARE GROUND)					
								Setdown (h) Below SWL. at Start of Fetch (X/F =0)		Setup (h) Above SWL at End of Fetch (X/F=1)		Distance of Bare Ground (Xo) from Start of Fetch	
Basin	Downwind Berm I.D.	Wind Dir. (Deg. True)	Wind Spd. (U) (mph)	(ft/sec)	Fetch Length (F) (ft)	Stillwater (SWL) Average Depth (d) (ft)	A (kU^2F)/(gd^2)	h/d	h (ft)	h/d	h (ft)	Xn/F	Xn (ft)
POND	N (DESIGN)	180	70	102.7	316	4.00	0.021	-0.006	-0.02	0.014	0.06	N/A	N/A
POND	N	180	80	117.4	316	4.00	0.028	-0.009	-0.04	0.017	0.07	N/A	N/A
POND	N	180	90	132.0	316	4.00	0.035	-0.013	-0.05	0.021	0.08	N/A	N/A
POND	N	180	100	146.7	316	4.00	0.044	-0.018	-0.07	0.024	0.10	N/A	N/A
POND	N	180	150	220.1	316	4.00	0.098	-0.048	-0.19	0.050	0.20	N/A	N/A
POND	N	180	200	293.4	316	4.00	0.174	-0.090	-0.36	0.085	0.34	N/A	N/A
POND	N	180	70	102.7	310	3.00	0.037	-0.014	-0.04	0.021	0.06	N/A	N/A
POND	N	180	80	117.4	310	3.00	0.049	-0.021	-0.06	0.027	0.08	N/A	N/A
POND	N	180	90	132.0	310	3.00	0.062	-0.028	-0.08	0.033	0.10	N/A	N/A
POND	N	180	100	146.7	310	3.00	0.076	-0.036	-0.11	0.039	0.12	N/A	N/A
POND	N	180	150	220.1	310	3.00	0.171	-0.088	-0.26	0.084	0.25	N/A	N/A
POND	N	180	200	293.4	310	3.00	0.304	-0.161	-0.48	0.145	0.44	N/A	N/A
POND	N	180	70	102.7	322	5.00	0.014	-0.002	-0.01	0.011	0.05	N/A	N/A
POND	N	180	80	117.4	322	5.00	0.018	-0.004	-0.02	0.013	0.06	N/A	N/A
POND	N	180	90	132.0	322	5.00	0.023	-0.007	-0.03	0.015	0.07	N/A	N/A
POND	N	180	100	146.7	322	5.00	0.028	-0.009	-0.05	0.017	0.09	N/A	N/A
POND	N	180	150	220.1	322	5.00	0.064	-0.029	-0.14	0.034	0.17	N/A	N/A
POND	N	180	200	293.4	322	5.00	0.114	-0.056	-0.28	0.057	0.28	N/A	N/A
POND	N	180	70	102.7	304	2.00	0.082	-0.039	-0.08	0.042	0.08	N/A	N/A
POND	N	180	80	117.4	304	2.00	0.107	-0.053	-0.11	0.054	0.11	N/A	N/A
POND	N	180	90	132.0	304	2.00	0.136	-0.068	-0.14	0.067	0.13	N/A	N/A
POND	N	180	100	146.7	304	2.00	0.168	-0.086	-0.17	0.082	0.16	N/A	N/A
POND	N	180	150	220.1	304	2.00	0.377	-0.203	-0.41	0.178	0.36	N/A	N/A
POND	N	180	200	293.4	304	2.00	0.670	-0.393	-0.79	0.307	0.61	N/A	N/A

Appendix E

Runup Elevations

APPENDIX E

INEEL CERCLA DISPOSAL FACILITY, IDAHO

RUNUP ELEVATIONS ON NORTH BERM OF EVAPORATION POND - SMOOTH SLOPES

Prepared by: Ken Lilly/CH2M HILL (24 JULY 2001)

This table shows the water elevation resulting from the combined wind setup and wave runup. Smooth berm faces with a 1V:3H slope were used.
Runup is the uprush limit of the wave on the face of the berm and is the vertical distance above the water surface elevation (stillwater + wind setup height).
Coastal Engineering Design and Analysis System (CEDAS) program *Runup and Overtopping on Impermeable Structures* was used for runup analysis.

H = Wave height. CEDAS program *Windspeed Adjustment and Wave Growth* was used to compute wave heights and periods for shallow water.
The predicted heights were adjusted for wave steepness limitations taking into account the limit to wave height in relation to wavelengths in shallow water.
The wave heights used in runup analysis were the maximum non-breaking height for the particular water depths and wavelengths for the period of waves predicted by CEDAS.
SWL = Stillwater elevation before the wind deforms the water surface.
h = Wind setup height at downwind end of fetch as measured above the initial stillwater level.
R = Runup height above the water surface at the berm.
R' = Runup elevation (SWL + h + R).

TABLE 1 - SETUP AND RUNUP FOR NORTH BERM OF EVAPORATION POND

BASIN	BERM	WIND DIR (Deg. True)	WIND SPD (mph)	AVG. BASIN DEPTH (d) (ft)	ELEV. BERM TOE (B) (ft)	FETCH (ft)	WAVE CLASS	WAVE H (ft)	WAVE PERIOD (sec)	STILLWATER ELEV (SWL) SWL = d + B (ft)	WIND SETUP HEIGHT (h) (ft)	WATER ELEV. AT TOE OF BERM Z = SWL + h (ft)	SMOOTH SLOPE RUNUP HEIGHT (R) 1V:3H (ft)	RUNUP ELEV. Re = Z + R (ft)
POND	N	180	70	4.0	4924.0	316	Hmax	0.72	1.00	4928.0	0.06	4928.06	0.64	4928.7
POND	N	180	80	4.0	4924.0	316	Hmax	0.81	1.06	4928.0	0.07	4928.07	0.72	4928.8
POND	N	180	90	4.0	4924.0	316	Hmax	0.91	1.12	4928.0	0.08	4928.08	0.81	4928.9
POND	N	180	100	4.0	4924.0	316	Hmax	1.01	1.18	4928.0	0.10	4928.10	0.90	4929.0
POND	N	180	150	4.0	4924.0	316	Hmax	1.43	1.42	4928.0	0.20	4928.20	1.28	4929.5
POND	N	180	200	4.0	4924.0	316	Hmax	1.81	1.63	4928.0	0.34	4928.34	1.66	4930.0
POND	N	180	70	5.0	4924.0	322	Hmax	0.74	1.01	4929.0	0.05	4929.05	0.66	4929.7
POND	N	180	80	5.0	4924.0	322	Hmax	0.83	1.07	4929.0	0.06	4929.06	0.74	4929.8
POND	N	180	90	5.0	4924.0	322	Hmax	0.92	1.13	4929.0	0.07	4929.07	0.82	4929.9
POND	N	180	100	5.0	4924.0	322	Hmax	1.02	1.19	4929.0	0.09	4929.09	0.91	4930.0